which he pointed out the possibility of a discharge of negatively electrified particles from the sun, which form nuclei of condensation, of which the earth receives its share on the side turned toward the sun.

Maxwell, in his original presentation of the electromagnetic theory of light, in 1873, pointed out that light should exert a pressure, and showed how to calculate its amount. He found that sunlight at the earth's surface should exert a pressure of 0.592×10^{-10} grams on one square centimeter, a quantity so small that it would seem to be hopeless to observe it. Nevertheless Poynting thinks he has obtained experimental proof of the existence of such a pressure. At the surface of the sun a cubic centimeter of water, which on the earth weighs one gram, would weigh 27.47 grams, and the pressure of sunlight on a square centimeter would amount to 2.75 milligrams. Such a mass would be attracted to the sun, but the case is quite different with bodies of extreme minuteness. A cube of water whose edge measures one-thousandth of a millimeter [a micron or μ] would experience an attraction of 27.47×10^{-12} grams and the pressure of light on its side would be $2.75\times10^{-3}\times10^{-8}=27.5\times10^{-12}$, or rather more than its weight. If, then, the cube has smaller dimensions than 1μ it will be repelled. The diameter of a molecule of hydrogen is possibly about 0.0002μ, and this contains perhaps 2000 "corpuscles". Negatively electrified ions of this order of magnitude are given off as kathode rays from the negative pole in a highly exhausted tube, from substances upon which kathode rays impinge, from hot bodies, and from radioactive substances; and these ions are capable of producing fresh ions by collision with the molecules of the gas thru which they pass.

Professor Poynting remarks that "one effect of this radiation pressure worthy of note would be its sorting action on dust particles. If the particles in a dust cloud circling round the sun are of different sizes or densities, the radiation accelerations on them will differ. The larger particles will be less affected than the smaller, will travel faster round a given orbit, and will draw more slowly in toward the sun. Thus a comet of particles of mixed sizes will gradually be degraded from a compact cloud into a diffused trail lengthening and broadening, the finer dust on the inner and the coarser on the outer edge".

A good account of Arrhenius's theory as applied to the explanation of comets' tails, the aurora, etc., has been given in the Popular Science Monthly, Vol. LX, p. 265, New York, 1902, by Prof. John Cox, of McGill University.

With reference to the aurora, Professor Cox says:

Perhaps the most interesting application of Arrhenius's theory is his explanation of the aurora. In a well-known experiment the streams of negative particles forming kathode rays in a Crookes tube are exposed to a magnetic field, when they are seen to describe helices round the lines of force. If the field is powerful enough they may thus be bent into a complete circle inside a moderately large tube.

Now the negative particles discharged from the sun arrive most thickly over the equatorial regions of the earth, which are most directly opposed to him. Long before they reach any atmosphere dense enough to excite luminescence, they are caught by the lines of force of the earth's magnetic field, which are horizontal over the equator, and have to follow them, winding round them in helices whose radii are so much less than their height above us that the effect to a beholder on the earth is as if they moved *along* the lines of force. Over the equator there is little luminescence for want of atmosphere. But as the lines of force travel north and south they dip downward, making for the magnetic poles, over which they stand vertical. Soon the particles find themselves in lower layers of the atmosphere, comparable in density with our highest artificial vacua, and begin to give out the darting and shifting lights of the kathode ray. But this can only be at the cost of absorption, and by the time the denser layers of air are reached their energy is exhausted. Hence the dark circles round the magnetic poles from which, as from behind a curtain, the leaping pillars of the aurora rise. From this point of view it is significant that Dr. Adam Paulsen, who has made a special study of the Northern Lights, found so many points of correspondence between them and kathode rays that in 1894 he was led to regard the aurora as a special case of the latter, tho unable to give any account of their origin in the upper atmosphere, such as is supplied by Arrhenius's theory.

In communicating the above article Mr. W. M. Watts makes the following appeal to American meteorologists:

I have come to the conclusion that it is most desirable that other and more accurate observations of the spectrum of the aurora should be obtained. I would respectfully suggest that the duty of obtaining such rests chiefly with you Americans, since your opportunities are, no doubt, greater than ours. Simple arrangements seem to me quite sufficient. In the first place choose a locality away from the lights of a town, preferably on an elevation. I should propose to construct a light observatory, or dark room, of wooden framework, mounted so as to revolve horizontally on a support, so as to oppose the slit side to the brightest part of the aurora. In one wall I would have a vertical slit, and outside of this the largest lens I could obtain for the purpose of concentrating the light upon the slit. This lens need not be achromatic, and, therefore, need not be costly. Inside I would have ready the photographic apparatus, and would supplement the photographic attempts by eye observations of the spectrum at every opportunity. For these eye observations I should choose my binocular spectroscope with large gratings. For the photographs I should use a spectrograph, consisting of a Thorp (or Wallace) grating as large as could be obtained, in front of a lens (telescope) of sufficient aperture to correspond to the grating, and of about 15 inches focal length; and last, but not least, I should use Wratten and Wainwright panchromatic plates.

Measurements of wave lengths are easily made with my binocular spectroscope. I have two different arrangements for the purpose, but in the case of the aurora I should place a nitrogen (or other) vacuum tube so as to occupy a portion of the slit—such vacuum tube being illuminated at will by means of a switch at the observer's position.

Altho such great institutions as the Carnegie Observatory on Mount Wilson, the Lick Observatory on Mount Hamilton, the Yerkes Observatory at Williams Bay, the Harvard College Observatory at Cambridge, and Mount Weather station at Bluemont, may have all the apparatus and men needed for the above-mentioned research, yet the help of others favorably located is still greatly to be desired. The outfit above recommended by Mr. Watts is not expensive as compared with the outfits for many other researches, but the work must be carried out by expert physicists such as are now found in every university.—EDITOR.

SMITHSONIAN METEOROLOGICAL TABLES.

The steady demand for the Smithsonian Meteorological Tables has justified the preparation of a revised edition, dated December, 1906, which is essentially a revision of the edition of 1893, prepared by the late Mr. George E. Curtis, as replacing the previous editions by Guyot, Libbey, and others.

The new edition of 1906 contains an introduction, followed by tables that are classified as thermometric, barometric, hygrometric, wind, geodetical, conversion, and miscellaneous. Among the new or enlarged tables we note the following:

Marvin's pressure of aqueous vapor at low temperatures—English and metric measures.

Bigelow's standard system of notation—formulas and constants.

Hanzlik's list of meteorological stations thruout the world, with their latitudes, longitudes, and altitudes.

Fergusson and Clayton's revision of international meteorological symbols, cloud notation, and cloud definitions.

The Beaufort notation for the use of navigators at sea.

The acceleration of apparent gravity on the earth.

The total number of pages (lx, 280), as compared with that in the revised edition of February, 1896, Smithsonian Miscellaneous Collections, 1032 (lix, 274), shows that the changes have been very conservative. The volume as a whole is a monument to the practical aspects of the work of the Smithsonian Institution.

KITE FLYING FROM MOUNTAIN TOPS.

In his address, October 28, 1907, at the opening of the Aeronautical Congress in New York, N. Y., the president, Prof. Willis L. Moore, referred to the Weather Bureau kite work, as follows:

The United States Weather Bureau at its observatory on Mount Weather, Va., began the systematic exploration of the upper air with kites on June 20 of the present year. Since that time ascents ranging from one to four miles above the station have been made daily, except on Sundays and holidays. On October 3, 1907, an altitude of 23,111 feet above sea level, or a little over four miles above the station, was reached, this being, so far as known, the greatest elevation hitherto reached with kites. At the above-named height the temperature was found to be 5.4° F. below zero. The details of this remarkable flight will be communicated to this Congress by Dr. Wm. R. Blair, of the Mount Weather staff.

The valuable information secured by the kite observations is telegraphed daily to the Central Office of the Weather Bureau in Washington, and is there used in the forecast service for the Middle Atlantic and New England States.

Meteorological stations on Pikes Peak and on Mount Washington in the United States, and on Ben Nevis, in Scotland, have been abandoned, especially as the data secured at those places were found to be of little or no use in the making of weather forecasts, largely because of the disturbing influence of radiation from the mountain itself; but now that the kite has been developed to such a high state of efficiency that at Mount Weather but one observation was mist in three months, it will be possible to reopen these stations and get readings of instruments far above the peaks, which will be more useful to the weather forecaster than any surface observations.

COLLIERY EXPLOSIONS AND BAROMETRIC PRESSURE

Many years ago the English Commission on Prevention of Explosions in Collieries, showed that the combustible gases escape from every crack and crevice into the mine most freely when the external barometric pressure is falling and lowest. The escape diminishes as the barometer rises, and is at its minimum when the pressure is highest. Therefore our ordinary range of pressure (1 inch either side of the average) is an important matter to the miner and the "lows", or storm centers, are still more important.

The London weather predictions always mention the approach of "falling barometer", and the mining industries take proper precaution. In the United States we forecast the approach of a storm center and mention rain, wind, and temperature without using the specific words "low barometer" or "falling pressure", since this is the regular feature of the storm center or "low".

However, local and general forecasters might do well to include this word in their messages to coal mining districts, so that there be no reason to accuse the Weather Bureau of neglecting their interests.

The "fire damps" or combustible vapors and gases are always present in coal mines and the miner who strikes a match, or strikes a spark with his pick, or carries an unprotected light runs an awful risk. The Davy lamp is still the miner's best friend; but even this should not be carried into poorly ventilated mines during very low barometric pressures.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

Aachen. Meteorologisches Observatorium.
Die öffentliche Wetterdienstelle Meteorologisches Observatorium Aachen. Auf der Wanderausstellung der Deutschen Landwirtschafts-Gesellschaft Düsseldorf 1907 ... Aachen. 1907. [13] p. f°.

Allahabad. Meteorologist.
Administration report ... 1906-7. Allahabad. 1907. 4 p. f°.

Bates, D. C.
The climate of New Zealand. Wellington. 1907. 7 p. 8°.

Bulgaria. Institut météorologique central.
Bulletin sismographique. No. 1. Sofia. 1907. 56 p. 8°.
Same. No. 2. Sofia. 1907. 34 p. 8°.
Tremblements de terre en Bulgarie. No. 7 .. 1906. Sofia. 1907. 56 p. 8°.

Fitzner, Rudolf.
Die Regenverteilung in den deutschen Kolonien. Berlin. 1907. iv, 115 p. 8°.

Grablowitz, G.
Weltkarte der Azimute und der Entfernungen für Hamburg. Laibach. 1907. 3 p. 8°.

Mauritius. Royal Alfred observatory.
Results of the magnetical and meteorological observations ... 1905. London. 1907. xxxiii, lxv p. f°.

Prussia. Königl. preussisches meteorologisches Institut.
Ergebnisse der Niederschlags-Beobachtungen im Jahre 1904. Berlin 1907. lii, 162 p. f°.

Roumania. Institutul meteorologic al Romaniei.
Analele. Tomul XVIII, Anul 1902. Bucuresti. 1907. v. p. f°.

St. Petersburg. Observatoire Constantin.
Étude de l'atmosphere. Fascicule II. Sondages aériens par cerfs-volants en 1902 et 1903 et par ballons en 1901, 1902 et 1903, exécutes à Pavlovsk et à St. Pétersbourg. St. Pétersbourg. 1906. ix, (45), 92 p. f°.

St. Petersburg. Université. Cabinet de géographie physique.
Travaux. 3me fasc. St. Pétersbourg. 1906. 121 p. f°.

Shaw, W. N.
Air currents and the laws of ventilation ... Cambridge. 1907. x, 94 p. 8°.

Ziegler polar expedition 1903-1905.
Scientific results obtained under the direction of William J. Peters ... Edited by John A. Fleming. Washington. 1907. vii, 630 p. f°.

RECENT PAPERS BEARING ON METEOROLOGY.

H. H. KIMBALL, Librarian.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——

American journal of science. New Haven. 4 ser. v. 24. Oct., 1907.
Barus, C. Successive cycles of coronas. p. 309-312.

Meteorological society of Japan. Journal. Tokyo. 26th year. Aug., 1907.
Akakura, K. The temperature of sea water in the harbor of Yokohama. (Jap.)
Okada, T. On the velocity of a falling raindrop (in English).

Nature. London. v. 76.
—— Meteorological observations. (Sept. 12, 1907.) p. 509.
—— International seismological congress. (Sept. 19, 1907.)
—— The Kingston earthquake. (Sept. 19, 1907.) p. 535.

Science. New York. New series. v. 26. Oct. 18, 1907.
—— Influence of forests upon wind velocity. [Abstract of article by Murat.] p. 518.

Scientific American. New York. v. 97.
—— A remarkable acoustic phenomenon. (Oct. 19, 1907.) p. 279. [Abstract of a paper by Alippi on "brontidi".]

Scottish geographical magazine. Edinburgh. v. 23. Oct., 1907.
Brown, Charles W. The Jamaica earthquake. p. 535-543.

Terrestrial magnetism. Baltimore. v. 12. June, 1907.
Homma, Y. Distribution of electricity in the atmosphere. p. 49-72.
Dike, P. H. Paulsen's résumé of recent theories of polar lights. [Abstract of paper by Paulsen.] p. 84-86.

Aérophile. Paris. 15 année. Août 1907.
Rotch, A. Lawrence. Les conditions météorologiques au-dessus de Saint-Louis et le Coupe Gordon-Bennett. (16 juil. 1907.) p. 223-245.

Ciel et terre. Bruxelles. 27 année.
Dubois, Eug. Quelle est l'importance du transport atmosphérique de sel marin? p. 223-245.
—— Les "bandes d'ombre" des éclipses totales de soleil. [Abstract of memoir by E. Holmes, with discussion.] p. 250-252.
Dobrowolski, A. Les cristaux de glace aériens et le phénomène des halos. (16 sept. 1907.) p. 336-342.

France. Académie des sciences. Paris. Tome 145. 16 sept. 1907.
Nodon, Albert. Observations sur l'action électrique du soleil et de la lune. p. 521-523.

Revue néphologique. Mons. Sept. 1907.
Mémery, Henri. Nuages, pluies, incendies. p. 161-162.
Bracke, A. Direction des nuages à Munich. II. Les cirro-cumulus et alto-cumulus. p. 162-164.
Shedd, J. S. L'évolution du cristal de neige. p. 164-166.

Annalen der Hydrographie und maritimen Meteorologie. Berlin. 25 Jahrgang. Heft 9. 1907.
—— Die Forschungsreise S. M. S. "Planet". p. 388-390.
Mecking, L. Die Treibeiserscheinungen bei Neufundland in ihrer Abhängigkeit von Witterungsverhältnissen. p. 396-409.